Developing EFSM-based stateful applications with FlowBlaze.p4 and ONOS

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5G and Mobile Edge Computing requires offloading of network functions to data plane

- **P4**: reference language for data plane programming
- **State Machines**: powerful abstraction to develop stateful packet processing
- **FlowBlaze [NSDI ‘19]**: EFSM-based stateful packet processing architecture

FlowBlaze currently lacks of:
- Prototyping platform and P4 implementation*
- Integration with DC-style fabric

*FlowBlaze.p4 [NFV-SDN ‘20]
FlowBlaze.p4*

- FlowBlaze library implementation in P4
- Open source library
- GUI to automatically translate EFSM into table entries
- Exploit all the tools from the P4 Community
- Targets: BMv2 and V1Model

FlowBlaze.p4 - configuration

Compile-time configuration

```
#include "../flowblaze_lib/flowblaze_metadata.p4"
#include "headers.p4"
#include "metadata.p4"
#include "../flowblaze_lib/flowblaze.p4"
...
#define FLOW_SCOPE { hdr.ipv4.srcAddr }
#define CUSTOM_ACTIONS_DEFINITION @name("FlowBlaze.forward") \
  \ action forward() { \ 
  \ } \ 
#define CUSTOM_ACTIONS_DEFINITION @name("FlowBlaze.drop") \ 
  \ action drop() { \ 
    mark_to_drop(standard_metadata); \ 
    exit; \ 
  }
```

Run-time configuration

- Draw the EFSM
- Auto generate the configuration via Python backend
ONOS integration

• Add flowblaze.p4 library to fabric.p4 pipeline
• Exploit current Trellis apps to program the rest of the fabric.p4 pipeline (routing, bridging, link discovery… )
• FlowBlaze ONOS app to control the FlowBlaze portion of the pipeline
FlowBlaze.p4 + ONOS WorkFlow

1. Configuration parameters
2. P4 compiler
3.1 P4Runtime
3.2 GUI
4. REST API

Fabric.p4

FlowBlaze.p4

FlowBlaze app

Trellis apps

BMv2 pipeline portion

ONOS

P4 pipeline portion

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https://github.com/ANTLab-polimi/ONOS-flowblaze